WHAT IS CLAIMED IS:

1. An uplink communication method in an orthogonal frequency division multiplexing access system, comprising:

generating upper and lower edge sidelobe canceling signals in a transmitting terminal for an uplink; and

inserting the upper and the lower edge sidelobe canceling signals into guard intervals, respectively, adjacent to a subband allocated to a user and performing inverse fast Fourier transform on user transmission signals and the upper and the lower edge sidelobe canceling signals.

2. The uplink communication method of claim 1, wherein the upper and the lower edge sidelobe canceling signals are transmitted over subcarriers, respectively, nearest to the subband among subcarriers included in the respective guard intervals.

3. The uplink communication method of claim 1, wherein the upper and the lower edge sidelobe canceling signals are obtained by performing an inner product on a transmission signal vector of the transmitting terminal and an optimized upper weight vector and performing an inner product on the transmission signal vector of the user transmitting terminal and an optimized lower weight vector, respectively.

4. A method of generating an edge sidelobe canceling signal in an orthogonal frequency division multiplexing access system, the method comprising:

inputting a user transmission signal vector X_j;

generating upper and lower weight vectors w_u and w_l according to:

$$w_u = \frac{(A_0 + A_{M+1})A^b - 2A_{0,M+1}A^f}{(A_0 + A_{M+1})^2 - 4A_{0,M+1}^2}$$ and

$$w_l = \frac{(A_0 + A_{M+1})A^f - 2A_{0,M+1}A^b}{(A_0 + A_{M+1})^2 - 4A_{0,M+1}^2}$$

where

$$A_{p,q} = (-1)^{p-q} \int_{M_G+1-\max(\Delta\varepsilon)}^{\infty} P_{\Delta\varepsilon}'(\alpha) \sin c(\alpha + p) \sin c(\alpha + q) d\alpha$$

$$A_p = \int_{M_G+1-\max(\Delta\varepsilon)}^{\infty} P_{\Delta\varepsilon}'(\alpha) \sin c^2(\alpha + p) d\alpha$$

$$P_{\Delta\varepsilon}'(\alpha) = \sum_{m=M_G+1}^{\infty} P_{\Delta\varepsilon}(m + \Delta\varepsilon)$$

$$A^f = \begin{bmatrix} A_{0,1} + A_{1,M+1} \\ A_{0,2} + A_{2,M+1} \\ \vdots \\ A_{0,M} + A_{M,M+1} \end{bmatrix}$$

$$A^b = \begin{bmatrix} A_{0,M} + A_{M,M+1} \\ A_{0,M-1} + A_{M-1,M+1} \\ \vdots \\ A_{0,1} + A_{1,M+1} \end{bmatrix}$$, and

$$X_j = \begin{bmatrix} X_j(K_j) \\ X_j(K_j + 1) \\ \vdots \\ X_j(K_j + M - 1) \end{bmatrix}$$ and

K_j denotes a parameter to determine a position of a j-th user subband, M denotes a number of subcarriers allocated to each user, $P_{\Delta\varepsilon}$ denotes a

probability density function of a difference $\Delta\varepsilon$ between frequency offsets of two subbands, and M_G+1 indicates a minimum distance between two subcarriers included in different subbands; and

performing an inner product on the user transmission signal vector and the upper weight vector to generate an upper edge sidelobe canceling signal and performing an inner product on the user transmission signal vector and the lower weight vector to generate a lower edge sidelobe canceling signal.

5. A computer program device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for a method of generating an edge sidelobe canceling signal in an orthogonal frequency division multiplexing access system, the method comprising:

inputting a user transmission signal vector X_j;

generating upper and lower weight vectors w_u and w_l according to:

$$w_u = \frac{(A_0 + A_{M+1})A^b - 2A_{0,M+1}A^f}{(A_0 + A_{M+1})^2 - 4A_{0,M+1}^2} \quad \text{and}$$

$$w_l = \frac{(A_0 + A_{M+1})A^f - 2A_{0,M+1}A^b}{(A_0 + A_{M+1})^2 - 4A_{0,M+1}^2}$$

where

$$A_{p,q} = (-1)^{p-q} \int_{M_G+1-\max(\Delta\varepsilon)}^{\infty} P_{\Delta\varepsilon}'(\alpha) \sin c(\alpha + p) \sin c(\alpha + q) d\alpha$$

$$A_p = \int_{M_G+1-\max(\Delta\varepsilon)}^{\infty} P_{\Delta\varepsilon}'(\alpha) \sin c^2(\alpha + p) d\alpha$$

$$P_{\Delta\varepsilon}'(\alpha) = \sum_{m=M_G+1}^{\infty} P_{\Delta\varepsilon}(m+\Delta\varepsilon)$$

$$A^f = \begin{bmatrix} A_{0,1} + A_{1,M+1} \\ A_{0,2} + A_{2,M+1} \\ \vdots \\ A_{0,M} + A_{M,M+1} \end{bmatrix}$$

$$A^b = \begin{bmatrix} A_{0,M} + A_{M,M+1} \\ A_{0,M-1} + A_{M-1,M+1} \\ \vdots \\ A_{0,1} + A_{1,M+1} \end{bmatrix}, \text{ and}$$

$$X_j = \begin{bmatrix} X_j(K_j) \\ X_j(K_j+1) \\ \vdots \\ X_j(K_j+M-1) \end{bmatrix} \text{ and}$$

K_j denotes a parameter to determine a position of a j-th user subband, M denotes a number of subcarriers allocated to each user, $P_{\Delta\varepsilon}$ denotes a probability density function of a difference $\Delta\varepsilon$ between frequency offsets of two subbands, and M_G+1 indicates a minimum distance between two subcarriers included in different subbands; and

performing an inner product on the user transmission signal vector and the upper weight vector to generate an upper edge sidelobe canceling signal and performing an inner product on the user transmission signal vector and the lower weight vector to generate a lower edge sidelobe canceling signal.

6. An uplink communication apparatus in an orthogonal frequency division multiplexing access system, the uplink communication apparatus including a transmitting terminal comprising:

a signal mapping unit for mapping a data stream input in serial to one of a quadrature-phase shift keying (QPSK) signal and a quadrature amplitude modulation (QAM) signal;

a serial-to-parallel conversion unit for converting the serial data stream mapped to one of the QPSK and QAM signals into parallel data;

an edge sidelobe canceling signal generation unit for generating an upper edge sidelobe canceling signal corresponding to an inner product of a transmission signal vector of the transmitting terminal and an optimized upper weight vector, and a lower edge sidelobe canceling signal corresponding to an inner product of the transmission signal vector of the transmitting terminal and an optimized lower weight vector, and for allocating the upper and the lower edge sidelobe canceling signals to subcarriers in guard intervals, respectively;

an inverse fast Fourier transform (IFFT) unit for performing IFFT on a transmission signal of the transmitting terminal allocated to subcarriers in a predetermined subband and the upper and the lower edge sidelobe canceling signals allocated to the subcarriers in the guard intervals; and

a guard interval insertion and parallel-to-serial conversion unit for inserting the guard intervals into the IFFT data provided from the IFFT unit, converting data resulting from the insertion into serial data, and outputting orthogonal frequency division multiplexing modulated data.

7. The uplink communication apparatus of claim 6, wherein the upper and the lower edge sidelobe canceling signals are transmitted over the subcarriers, respectively, nearest to the predetermined subband among subcarriers included in the respective guard intervals.

8. An apparatus for generating an edge sidelobe canceling signal in an orthogonal frequency division multiplexing access system, the apparatus comprising:

a storage unit for storing one of an upper weight vector and a lower weight vector and reading vectors of one of the upper and the lower weight vector in a predetermined order according to an edge sidelobe selection signal; and

a matrix operation unit for performing an inner product on a user transmission signal vector and one of the upper and the lower weight vector provided from the storage unit, thereby generating one of an upper and a lower edge sidelobe canceling signal.

9. The apparatus of claim 8, wherein when a single subband comprises M subcarriers, the storage unit is implemented by a look-up table having a size of $M \times 1$.

10. The apparatus of claim 8, wherein the upper and the lower edge sidelobe canceling signals are each a function of a statistical characteristic of a frequency offset of the transmitting terminal and a number of the subcarriers included in the subband.